

SELECTION CRITERIA

Spectrum Utilization

Coverage Area

Accommodation Percentage

Economics

Cost to Broadcasters

Cost to Alternative Media

Cost to Consumers

Technology

Audio/Video Quality

Transmission Robustness

Scope of Services and Features

Extensibility

Interoperability considerations

Target Values for the Selection Criteria

SS/WP4 has identified ten criteria to be used in recommending an advanced television system. Target values are being developed to represent the target level of performance aspired to in an advanced television system. These target values do not represent minimum criteria that tested systems are expected to exceed. The ten selection criteria and associated target values are:

Coverage area — Comparable to NTSC.

Accommodation percentage — 100% of currently authorized full service stations and pending applications for full service stations. It is desirable to accommodate all noncommercial vacant allotments.

Audio/video quality — The CCIR has defined HDTV in terms of current television systems. That definition, applied to NTSC, leads to the following target value. The resolution should be about twice that of NTSC in both the vertical and horizontal directions, the temporal resolution should not be less than NTSC, the color rendition should be superior to NTSC, any artifacts should be less objectionable than are NTSC artifacts, the aspect ratio should be 16:9, and the subjective sound quality should be comparable to compact disc.

Transmission robustness — Better than NTSC within the defined coverage area.

Scope of services and features — When compared with NTSC, increased capability and flexibility in the ability to provide audio, captioning, data services, etc.

Extensibility — A new service must provide long life, just as NTSC has provided a long life, by supporting future enhancements and future technology advances.

Interoperability — A new service should be "friendly" to alternate delivery media. Interoperability with Cable TV is mandatory. Interoperability with VCRs, satellite, computer, data communications, and telecommunications applications with simple interfacing hardware is also an objective.

Cost to broadcasters

Cost to alternative media

Cost to consumers

It is difficult to establish target values for cost issues. Furthermore, cost is a function of market conditions and production volume. Key issues for broadcasters and cable operators would be the cost to "pass" programming. Key issues for consumers would be the cost of a receiver and a VCR after five years of production. In the SS/WP4 final report, it may be reasonable to point out the cost of current top-of-the-line NTSC projection receivers and top-of-the-line VCRs for reference as base-line costs, but not as target values.

**FCC ADVISORY COMMITTEE ON ADVANCED TELEVISION SERVICE
SYSTEMS SUBCOMMITTEE
WORKING PARTY ON SYSTEM STANDARDS (SS/WP4)**

OUTLINE FOR SS/WP4 FINAL REPORT

- 1. Executive Summary**
- 2. Introduction**
- 3. Background and History**
- 4. Contributions from the Planning Subcommittee**
 - 4.1. WP1 — Working Party on Technology Attributes and Assessment
 - 4.2. WP2 — Working Party on Testing and Evaluation Specifications
 - 4.3. WP3 — Working Party on Spectrum Utilization and Alternatives
 - 4.4. WP4 — Working Party on Alternative Media Technology and BC Interface
 - 4.5. WP5 — Working Party on Economic Factors and Market Penetration
 - 4.6. WP6 — Working Party on Systems Subjective Assessment
 - 4.7. WP7 — Working Party on Audience Research
 - 4.8. AG1 — Advisory Group on Creative Issues
 - 4.9. AG2 — Advisory Group on Consumer/Trade Issues
- 5. Contributions from the Systems Subcommittee**
 - 5.1. WP1 — Working Party on Systems Analysis
 - 5.2. WP2 — Working Party on Testing and Evaluation
 - 5.2.1. ATTC Report
 - 5.2.2. CableLabs Report
 - 5.2.3. ATEL Report
 - 5.2.4. Field Test Report
 - 5.3. WP3 — Working Party on Economic Assessment
 - 5.4. WP4 — Working Party on System Standards
- 6. Contributions from the Implementation Subcommittee**
 - 6.1. WP1 — Working Party on Policy and Regulation
 - 6.2. WP2 — Working Party on Transition Scenarios

7. Selection Criteria

7.1. Introduction

7.2. Spectrum Utilization Criteria

- 7.2.1. Background
- 7.2.2. Coverage Area
- 7.2.3. Accommodation Percentage

7.3. Economics Criteria

- 7.3.1. Background
- 7.3.2. Cost to Broadcasters
- 7.3.3. Cost to Alternative Media
- 7.3.4. Cost to Consumers

7.4. Technology Criteria

- 7.4.1. Background
- 7.4.2. Audio/Video Quality
- 7.4.3. Transmission Robustness
- 7.4.4. Scope of Services and Features
- 7.4.5. Extensibility
- 7.4.6. Interoperability Considerations

8. Analysis of System Data

8.1. System A

- 8.1.1. Policy and Regulatory Issues
- 8.1.2. Spectrum Utilization
- 8.1.3. Economics
- 8.1.4. Technology

8.2. System B

- 8.2.1. Policy and Regulatory Issues
- 8.2.2. Spectrum Utilization
- 8.2.3. Economics
- 8.2.4. Technology

8.3. System C

- 8.3.1. Policy and Regulatory Issues
- 8.3.2. Spectrum Utilization
- 8.3.3. Economics
- 8.3.4. Technology

8.4. Other Sections as necessary (one per system)

9. Comparisons and Recommendations

**Special Panel
Responsibility**

9.1. System Comparison

- 9.1.1. Policy and Regulatory Issues**
- 9.1.2. Spectrum Utilization**
- 9.1.3. Economics**
- 9.1.4. Technology**

9.2. Recommendations

- 9.2.1. Policy and Regulatory Issues**
- 9.2.2. Spectrum Utilization**
- 9.2.3. Economics**
- 9.2.4. Technology**

10. Implementation Plan

11. Future Work

- 11.1. Development of Standards**

12. Conclusions

13. Notes and Comment

14. Bibliography

15. Acknowledgements

Appendices

- A1. Raw Data**
- A2. Methods of Data Reduction**
- A3. Glossary**

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- 7.3.1. Background**
- 7.3.2. Cost to Broadcasters**
- 7.3.3. Cost to Alternative Media**
- 7.3.4. Cost to Consumers**

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- 7.4.1. Background**
- 7.4.2. Audio/Video Quality**
- 7.4.3. Transmission Robustness**
- 7.4.4. Scope of Services and Features**
- 7.4.5. Extensibility**
- 7.4.6. Interoperability Considerations**

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8.1. System A

- 8.1.1. Policy and Regulatory Issues**
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- 8.1.4. Technology**

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- 8.2.1. Policy and Regulatory Issues**
- 8.2.2. Spectrum Utilization**
- 8.2.3. Economics**
- 8.2.4. Technology**

8.3. System C

- 8.3.1. Policy and Regulatory Issues**
- 8.3.2. Spectrum Utilization**
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- 8.3.4. Technology**

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- 9.2.1. Policy and Regulatory Issues
- 9.2.2. Spectrum Utilization
- 9.2.3. Economics
- 9.2.4. Technology

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Appendices

- A1. Raw Data
- A2. Methods of Data Reduction
- A3. Glossary

FCC ADVISORY COMMITTEE ON ADVANCED TELEVISION SERVICE

SYSTEMS SUBCOMMITTEE

Chairman:

Irwin Dorros (Bellcore)

Vice Chairman:

Tyrone Brown (Steptoe and Johnson)

Vice Chairman:

John Abel (NAB)

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Chairman:

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Chairman:

Bob Hopkins (ATSC)

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Hugo Gaggioni (Sony)
Bruce Sidran (Bellcore)
Louis Williamson (ATC)

Listing of Systems Subcommittee Meetings

<u>Date</u>	<u>Location</u>
1/25/88	Washington, DC
4/13/88	Las Vegas, NV
8/10/88	Washington, DC
10/19/88	New York, NY
2/9/89	Washington, DC
5/31/89	New York, NY
8/1/89	New York, NY
11/28/89	Washington, DC
2/27/90	Washington, DC
6/21/90	Washington, DC
11/6/90	Alexandria, VA
2/21/91	Washington, DC
6/27/91	Washington, DC
9/26/91	Alexandria, VA
2/19/92	Washington, DC

SS - 0000

06 Mar 92

ATV SYSTEMS SUBCOMMITTEE

Numbered Documents

<i>SS Number</i>	<i>Date</i>	<i>To/From/Subject</i>
0317	03/06/92	Wiley/Dorros/Fifth Interim Report
0316	03/06/92	SS Members/Dorros/Fifth Interim Report
0315	03/03/92	Justus/Dorros/Proposed Specialist Group Approach
0314	02/21/92	Dorros/Justus/Recommendation Process
0313	02/14/92	Dorros/Sikes/Committee Structure
0312	02/24/92	Dorros/Wedam/Comments on Fifth Interim Report
0311	02/25/92	Dorros/Bingham/Comments on Fifth Interim Report
0310	02/25/92	Dorros/Luplow/Comments on Fifth Interim Report
0309	02/25/92	Dorros/Hopkins/Comments on Fifth Interim Report
0308	03/00/92	SS 02/19/92 Meeting Minutes
0307	02/19/92	Hopkins Report on CCIR Task Group 11/1 Meeting
0306	02/20/92	Proponents/Dorros/Fifth Interim Report
0305	02/19/92	Sidran Report on CCIR ISP 11/9 Meeting
0304	02/11/92	2/11 Draft of Fifth Interim Report
0303	01/27/92	SS/Dorros/Meeting Notice and Agenda
0302	11/12/91	Thorpe/Dorros/PS/WP5 Work Plan
0301	10/03/91	Dorros/Rast/Testing of DigiCipher System
0300	10/17/91	SS/Dorros/Fifth Interim Report
0299	10/02/91	Hopkins/Wiley/Target Value for Recommendation Criteria
0298	09/27/91	9/26/91 Meeting Minutes
0297	09/25/91	SS/WP1 Status Report
0296	08/14/91	SS/Dorros/Meeting Notice and Agenda
0295	08/01/91	Flaherty/Dorros/WP3 and WP5 Relationship
0294	08/01/91	Minutes Transmittal Letter
0293	06/28/91	6/27/91 Meeting Minutes
0292	06/26/91	Flaherty/Dorros/WP3 and WP5 Relationship
0291	06/21/91	Dorros/Luplow/Source Materials
0290	04/30/91	SS/Dorros/SS Meeting Notice & Agenda
0289	03/29/91	Flaherty/Dorros/Subjective assessment tests
0288	03/29/91	Wiley/Dorros/Comments on Fourth Interim Report
0287	02/22/91	SS Meeting Minutes
0286	03/05/91	Dorros/Dayton/Submission for Fourth Interim Report
0285	02/11/91	Dorros/Richer/Submission for Fourth Interim Report
0284	02/15/91	SS/Dorros/2/15/91 Draft of Fourth Interim Report

0283	02/06/91	Richer/Dorros/Field Tests
0282	02/06/91	Dorros/Thorpe/Submission for Fourth Interim Report
0281	02/20/91	Dorros/Hopkins/Submission for Fourth Interim Report
0280	01/14/91	Dayton/ID/New test schedule
0279	12/18/90	Wiley/Bingham, Carnes, Donahue/Proponent changes
0278	12/27/90	Chairs/Dorros/Advisory meeting - interim report
0277	12/14/90	Chairs/Dorros/Fourth interim report
0276	11/26/90	Dayton/Dorros/
0275	12/12/90	SS/Dorros/Next SS meeting
0274	12/10/90	SS/Dorros/Meeting minutes transmittal
0273	12/06/90	Meeting Minutes
0272	10/19/90	SS/ID/Mtg reminder letter
0271	10/15/90	Dorros/Richer/Completion of test procedures
0270	09/24/90	Wiley/Dorros/WP4 - Weighted voting
0269	09/24/90	Hopkins/Wiley/WP4 - Weighted voting
0268	09/20/90	Dayton/Dorros/Complete tech analysis
0267	09/11/90	Wiley/Dorros/Consensus conclusions
0266	09/11/90	Dorros/Wiley/Pearlman letter re: consensus conclusions
0265	09/06/90	Richer/Dorros/Retesting of systems
0264	08/16/90	SS/Dorros/SS Mtg notice change
0263	08/08/90	SS/Dorros/SS Mtg notice
0262	07/13/90	SS/Dorros/6/21/90 SS Meeting Minutes
0261	06/21/90	Weiss/NBC Statement on Prioritization of Testing of Systems
0260	06/21/90	Dayton/Dorros/Development of complete tech. analysis
0259	06/21/90	SS Committee/Bob Hopkins/CCIR IWP 11/6
0258	06/05/90	Gerdes/Dorros/Withdrawal of PSI
0257	05/21/90	Dorros/Gerdes/Withdrawal of PSI
0256	05/18/90	Dayton/Gerdes/Inappropriate meeting scheduling
0255	05/15/90	Flaherty-Dorros/Wiley/Redundancy of efforts
0254	05/14/90	Richer/Dorros/confirmations
0253	05/01/90	Gerdes/Dorros/grant
0252	04/25/90	SS/Dorros/6/21 SS Meeting
0251	04/24/90	Dorros/Blake/On-site review by WP1
0250	04/24/90	Dorros/Sugimoto/Response on grant
0249	04/18/90	Gerdes/Dorros/Pursuit of preliminary system certification
0248	04/16/90	Dorros/Crutchfield/Resignation letter
0247	04/13/90	Crutchfield/Dorros/Thank you letter
0246	04/13/90	Lim/Dorros/Grant of preliminary system certification
0245	04/13/90	Faroudja/Dorros/Grant of preliminary system certification
0244	04/13/90	Richer/Dorros/Welcome letter
0243	04/12/90	SS/Dorros/Crutchfield resignation - Richer announcement
0242	04/09/90	Wiley-Dorros/Rankin/Creation of ABS of Canada
0241	04/03/90	Dorros/Carnes/Test Slot Requirement
0240	04/02/90	Dayton-Crutchfield-Thorpe-Hopkins/Dorros/Effects on other

0239	04/02/90	Dorros/Luplow/Home recording of ATV System
0238	03/12/90	Lim/Dorros/Pursue preliminary system certification
0237	03/12/90	Gerdes/Dorros/Pursue preliminary system certification
0236	03/12/90	Faroudja/Dorros/Pursue preliminary system certification
0235	03/12/90	Greebe/Dorros/Grant of preliminary system certification
0234	03/12/90	Carnes/Dorros/Grant of preliminary system certification
0233	03/12/90	Sugimoto/Dorros/Grant of preliminary system certification
0232	03/12/90	Hanson/Dorros/Grant of preliminary system certification
0231	02/27/90	SS Meeting Minutes
0230	02/13/90	SS/Dorros/Third Interim Report & Wiley Package
0229	01/11/90	SS/WP4 Progress Report
0228	01/25/90	SS/Dorros/Feb. 27 mtg. notice and agenda
0227	01/26/90	Wiley/Dorros/SS Statement on release of subjective
0226	12/27/89	Dayton/Dorros/Transmittal letter for 0225
0225	12/21/89	Dorros/Felker/ATV system submission
0224	12/22/89	Dorros/Topol/Development of multiport receiver interface
0223	12/18/89	Luplow/Dorros/Format for 12/31 system descrip.
0222	12/08/89	11/28 Meeting Minutes
0221	12/04/89	McKinney/Dorros/Transmittal of WP4 documents
0220	12/04/89	Topol/Dorros/Transmittal of WP4 documents
0219	11/08/89	Dorros/Sikes/Continue to serve on AC
0218	11/07/89	Dorros/Luplow/Response to 10/6 Letter
0217	10/31/89	SS Members/Dorros/11/28 SS mtg
0216	10/20/89	Dayton, Crutchfield, Hopkins, Thorpe/Dorros/
0215	11/03/89	Schine/Dorros/Availability of Testing Time
0214	10/04/89	Dorros/Sugimoto
0213	10/06/89	Luplow/Dorros/Clarification of Testing Process
0212	10/04/89	Dayton/Dorros/Flowchart for System Certification
0211	09/22/89	Dorros/Schine/Wiley Meeting
0210	09/12/89	Dorros/Iredale/Response to 8/25
0209	09/13/89	Dorros/Tietja/Response to 8/11
0208	09/14/89	Dorros/Rosner/Response to 8/11
0207	09/14/89	Dorros/Luplow/Response to 8/11
0206	09/15/89	Dorros/Gerdes/Response to 8/11
0205	09/01/89	Dorros/Sawchuk/Recommendation of CABSC
0204	08/29/89	Dorros/Solomon/Testing
0203	08/25/89	Dorros/Cavallerano/Info for 09/28/89 Meeting
0202	08/29/89	Dorros/Robinson/Hardware Availability
0201	08/25/89	Schine/Dorros/HRS Testing Participation
0200	08/25/89	Iredale/Dorros/Proponent status
0199	08/22/89	8/1 SS Meeting Minutes
0198	08/16/89	Dorros/Ohmura/Removal from proponent list
0197	08/11/89	Dorros/Iredale/Removal from proponent list
0196	08/11/89	Sie/Dorros/

0195	08/11/89	Luplow/Dorros/Info for ATTC
0194	08/11/89	Gerdes/Dorros/Info for ATTC
0193	08/11/89	Toth/Dorros/Info for ATTC
0192	08/11/89	Sugimoto/Dorros/Info for ATTC
0191	08/11/89	Solomon/Dorros/Info for ATTC
0190	08/11/89	Schreiber/Dorros/Info for ATTC
0189	08/11/89	Faroudja/Dorros/Info for ATTC
0188	08/11/89	Tietjen/Dorros/Info for ATTC
0187		Not issued
0186	08/04/89	Lippel/Dorros/Removal from prop.list
0185	08/04/89	Osborne/Dorros/Removal from prop.list
0184	08/04/89	Ilkovics/Dorros/Removal from prop.list
0183	08/04/89	Forshay/Dorros/Removal from prop.list
0182	08/04/89	Lucas/Dorros/Removal from prop.list
0181	08/04/89	Conner/Dorros/Removal from prop.list
0180	08/04/89	Iredale/Dorros/Removal from prop.list
0179	08/04/89	Ohmura/Dorros/Removal from prop.list
0178	08/04/89	Seigel/Dorros/Removal from prop.list
0177	07/25/89	Status of Proponent Hardware Availability
0176	07/25/89	Dorros/Sie/Advisory Committee
0175	07/26/89	Dayton/Dorros/Certification of ATV systems
0174	07/12/89	WP4 ATV Systems Models
0173	07/11/89	WP3 Meeting Minutes
0172	07/14/89	Dorros/Seigle/Hardware availability
0171	07/20/89	Beasley/Dorros/Response to "Notes on HDTV"
0170	07/11/89	Dorros/Conner/Hardware availability
0169	07/18/89	Wiley/Dorros/Letter to remaining proponents
0168	07/12/89	Dorros/Faroudja/Hardware availability
0167	07/13/89	SS Officers, Members/Dorros/8/1 Meeting Notice
0166	07/05/89	Wiley, Fannon, Green/Dorros/Proponent responses
0165	07/03/89	Dorros/Dayton/WP1 status
0164	06/30/89	Dorros/Sugimoto/Hardware availability
0163	06/30/89	Dorros/Tsinberg/Hardware availability
0162	06/30/89	Dorros/Gerdes/Hardware availability
0161	06/27/89	Dorros/Tietjen/Hardware availability
0160	06/29/89	Dorros/Forshay/Hardware availability
0159	06/30/89	Dorros/Ohmura/Hardware availability
0158	07/01/89	Dorros/Stow/Test Parameter Plan
0157	06/29/89	Wiley/Test Procedures & Test Mgmt. Plans
0156	06/27/89	Dorros/Schreiber/Hardware availability
0155	06/28/89	Dorros/Crutchfield/WP2 status
0154		Not issued
0153	06/27/89	Dorros/Luplow/Hardware availability
0152	06/23/89	Dorros/Faroudja/Hardware availability

0151	06/21/89	Dorros/Kettler/Alternative approach to ATV studies
0150	06/21/89	Dorros/Solomon/Hardware availability
0149	06/15/89	Dorros/Wiley/Hanover nomination
0148	06/22/89	5/31 SS Meeting Minutes
0147	06/21/89	Hanover/Confirmation as WP2 VC
0146	06/21/89	Dayton/Reply on hardware availability
0145	05/31/89	Dorros/CRC/Input on ATV system model
0144	05/19/89	Dorros/Toth/Input on ATV system model
0143	05/19/89	Dorros/Rau/Input on ATV system model
0142	05/04/89	Dorros/Schreiber/Input on ATV system model
0141	05/18/89	Dorros/Heimbach/Input on ATV system model
0140	05/24/89	Dorros/Bellisio/Input on ATV system model
0139	05/22/89	Dorros/Engel/Input on ATV system model
0138	06/16/89	Dorros/Iredale/Hardware availability
0137	05/31/89	Dorros/Wiley/Proponent letters
0136	06/09/89	Forshay/Hardware availability
0135	06/09/89	Ilkovics/Hardware availability
0134	06/09/89	Conner/Hardware availability
0133	06/09/89	Lippel/Hardware availability
0132	06/09/89	Luplow/Hardware availability
0131	06/09/89	Lucas/Hardware availability
0130	06/09/89	Gerdes/Hardware availability
0129	06/09/89	Osborne/Hardware availability
0128	06/09/89	Marsiglio/Hardware availability
0127	06/09/89	Sugimoto/Hardware availability
0126	06/09/89	Glenn/Hardware availability
0125	06/09/89	Schreiber/Hardware availability
0124	06/09/89	Faroudja/Hardware availability
0123	06/09/89	Iredale/Hardware availability
0122	06/09/89	Carnes/Hardware availability
0121	06/09/89	Ohmura/Hardware availability
0120	06/09/89	Siegel/Hardware availability
0119	06/07/89	Dayton, Thorpe, Hopkins/ATTC memo, re: 2nd marathon session
0118	06/05/89	Ciciora/Memo on HDTV/workstations
0117	06/05/89	Wiley/Zenith letter on aspect ratio
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**Systems Subcommittee
Working Party 1**

Chairman's Status Report
January 31, 1992

Submitted to:
Irwin Dorros
Chairman, Systems Subcommittee

Submitted by:
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SS/WP-1 STATUS REPORT (Jan 31, 1992) DRAFT

1. Introduction

Since the last report, SS/WP1 has held two meetings. The first, held on November 6, 1991, resulted in the final certification of the Zenith/AT&T Digital Spectrum Compatible System. The second meeting, held on January 30, 1992 Resulted in the final certification of the ATRC Advanced Digital Television (ADTV) system. The Analysis Task Force has been active in the definition of needed System-Specific Tests for digital systems.

2. Proponent Status

2.1 Advanced Television Research Consortium

The ADTV system received final certification January 30, 1992. The certification was based on the documentation submitted by the proponent and the detailed analysis provided by the Analysis Task Force. The ADTV system addresses the NTSC interference issue with the use of two 32 QAM carriers "Spectrally Shaped QAM". A narrowband carrier with increased power operates in the region of the NTSC lower sideband, and wideband carrier with decreased power operates in the region between the NTSC visual carrier and the NTSC sound carrier. The system promises considerable extensibility, with features that address a number of ancillary services. Due to time constraints, the prototype hardware does not include all the extended features described in the system document. After some discussion, the ATRC agreed to provide a condensed document that described only the equipment to be tested in order to simplify correlation of test results with system expectations. This condensed document is due in two weeks, and will be reviewed by the Analysis Task Force for before distribution to all WP1 members. The ATTC has completed the testing of ACTV, but no data has been released for analysis.

2.2 American Television Alliance

The DIGICIPHER system is currently in test at the ATTC and will be the first system to undergo system-specific testing. The ATVA-Progressive system will be reviewed in the next two months and a final certification meeting will be held some time in April according to the present schedule.

2.3 Nippon Hoso Kyokai

The NHK Narrow Muse system is through testing at the ATTC, but no data has been released for analysis.

2.4 Zenith/AT&T

SS/WP-1 STATUS REPORT (Jan 31, 1992) DRAFT

The Zenith/AT&T Digital Spectrum Compatible system received final certification at the November 6, 1991 Meeting. This system contains an number of new ideas in data transport, including an extension of duobinary code to allow for the use of a multi-tap data comb filter at the receiver designed to minimize NTSC interference. The DSC system uses a mix of two level code and four level code in a vestigial sideband transmission with a pilot carrier located near the lower edge of the channel. This system is scheduled for test in the next month.

3.0 Future Work

In one more meeting, currently scheduled for sometime in April, SS/WP1 expects to certify the ATVA-Progressive system. At that point, SS/WP1 will have completed its initial task set. From an initial field of 23 systems, 6 will have been identified as worthy of testing and evaluation.

The Analysis Task Force which was commissioned a year and a half ago has developed into a truly expert analysis team. This team has helped proponents refine their documents to make them better reflect the proponents' systems as well as aid in the wider understanding of the subtle details of each system.

Following its next meeting, SS/WP1 will await further instructions from the Systems Subcommittee.

SSWP2-0876
19 FEB 92

**Federal Communications Commission
Advisory Committee on Advanced Television Services
Systems Subcommittee
Working Party 2: ATV System Evaluation and Testing**

Fifth Interim Report
February, 1992

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